

Emergency Flight Control System Using One Engine and Fuel Transfer

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Providing safe landing capability for aircraft in distress

Innovators at NASA's Armstrong Flight Research Center have developed a patented emergency flight control system designed to increase the chances of safely landing an aircraft suffering from total loss of flight controls and loss of one or more engines on one side. Under normal conditions, aircraft control is achieved with hydraulic, cable, or a pressurized control surface. In catastrophic situations, total loss of control surfaces may occur, along with loss of one or more wing engines. Armstrong's system provides the capability to uniquely combine lateral fuel transfer with the thrust of at least one remaining engine to enable emergency aircraft control.

In cases where at least one engine and lateral fuel transfer are available, the system enables a pilot to regain control over the aircraft by moving its center of gravity via fuel transfer to work in conjunction with the thrust of the operating engine(s). The system enables the center of gravity to be placed either closer to or farther away from the operational engine(s) to help maintain wings-level flight, including in aircraft with a third engine associated with the tail section. In four-engine aircraft suffering from loss of engine control on one side, the system enables shifting of the center of gravity closer to the remaining functional engines. Differential thrust between the remaining engines, along with the center-of-gravity shift via lateral fuel transfer, is then used for control of the pitch and roll of the aircraft during a landing. The emergency flight control system is programmed into the flight control computer that the pilot can activate at the aircraft's yoke or the autopilot knob.

Benefits

- **Life-saving:** By enabling emergency control of aircraft in catastrophic situations, the technology may allow safer landings with less loss of life than would otherwise be possible.
- **Cost-saving:** The system's crash-avoidance capability has the potential to save hundreds of thousands of dollars in aircraft structures that may otherwise be a total loss.
- **Simple:** Integrated with an aircraft's flight control programming system, the technology is easy for pilots to use — a significant advantage in emergency situations.

Applications

This technology could be used for real-time shape control and health management of any structure:

- Government and military aircraft
- Industry research aircraft
- General aviation aircraft
- High-endurance drones

Commercial Opportunity

This technology is part of NASA's technology transfer program. The program seeks to stimulate broad commercial use/application of NASA-developed technologies. NASA is flexible in its agreements, and opportunities exist for licensing and joint development.

Contact Information

If you would like more information about this technology or about NASA's technology transfer program, please contact:

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